Capabilities Information Exchange (CIE)

15 December 2016

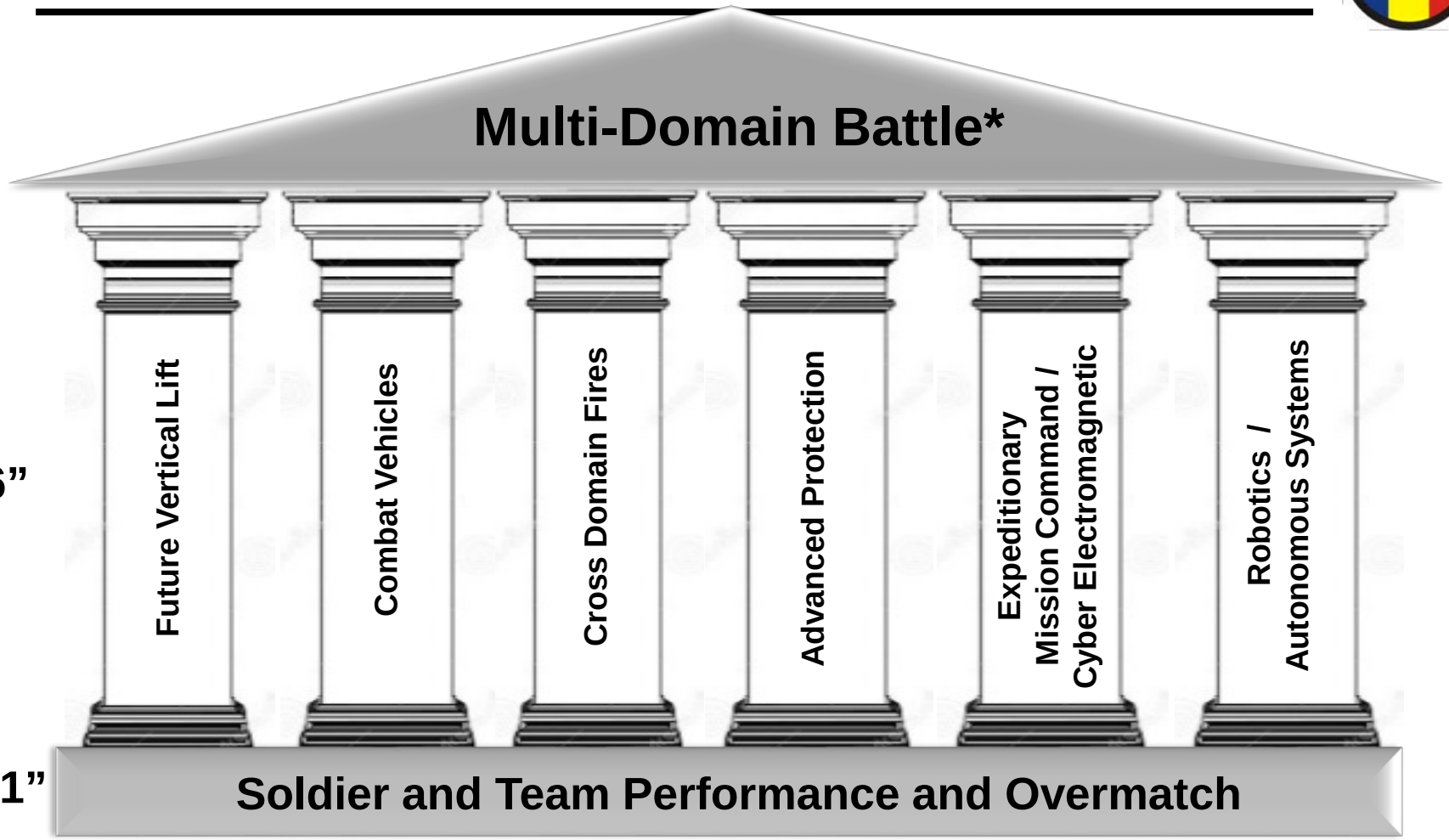
“America’s Army: Ready Today, Preparing for the Future”

Agenda

Start	End	Main Auditorium	Speaker
0800	0805	Administrative Details	LTC Van De Hey
0805	0830	Welcome/Introductory Remarks	TRADOC/ARCIC Leadership
0830	0850	Briefing Multi-Domain Battle/TRADOC Big 6+1	LTC Chasse
0850	0900	Q&A, Briefing Multi-Domain Battle/TRADOC Big 6+1	
0900	0920	The Warfighters' Science and Technology Needs	Mr. Meneghini
0920	0930	Q&A, The Warfighters' Science and Technology Needs	
0930	0950	Force design efforts & the TRADOC Campaign of Learning	Mr. Bray
0950	1000	Q&A, Force design efforts & the TRADOC Campaign of Learning	
1000	1020	Defense Innovation Unit Experimental (DIUx)	LTC Gossett
1020	1030	Q&A, Defense Innovation Unit Experimental (DIUx)	
1030	1050	RAS draft requirements documents	MAJ Dvorak
1050	1100	Q&A, RAS	
1100	1120	CVMS draft requirements documents	LTC Sanchez
1120	1130	Q&A, CVMS	
1130	1200	Administrative	
1200	1330	Lunch/ reset/ move to Bldg 950	
1330	1500	Future Operating Environment/ Overmatch	TRADOC G2

Multi-Domain Battle/ TRADOC Big 6+1
LTC Chasse (CARD)

TRADOC "Big 6 Plus 1" Capabilities



Video MDB

**** Multi-Domain Battle:** Cross-domain operations in context of joint combined arms maneuver that create temporary windows of superiority across multiple domains, and allow Joint Forces to seize, retain, and exploit the initiative.*

Required Capabilities to support Multi-Domain Battle

Multi-Domain Battle

Cross-domain operations in context of joint combined arms maneuver that create temporary windows of superiority across multiple domains, and allow Joint Forces to seize, retain, and exploit the initiative

Required Capabilities	TRADOC Big 6+1
✓ Aircraft that enable expeditionary maneuver that have improved speed, payload, endurance, reliability, maintainability, survivability ✓ Runway-independent tactical unmanned air systems	**Future Vertical Lift**
✓ Light weight combat vehicle that provides mobile protected firepower to enable freedom of action and freedom of movement ✓ Assured close combat overmatch with superior mobility, protection and lethality to maneuver and survive in close combat against enemies possessing unmanned aircraft systems, rockets, mortars, artillery	**Combat Vehicles**
✓ Lethal and nonlethal fires impacting all domains and the electromagnetic spectrum to achieve desired effect while preventing fratricide and minimizing collateral damage ✓ Cross Domain Fires that project power from land by delivering timely & accurate effects into other domains	**Cross Domain Fires**
✓ Modular active protection systems that protect combat vehicles and aircraft from current and future threats ✓ Ability to obscure the electromagnetic spectrum selectively to defeat or degrade adversary detection, observation, and engagement capabilities	**Advanced Protection**
✓ Ability to exercise mission command in denied and/or degraded environments to the company level ✓ Ability to command and control forward distributed and disaggregated forces and forces on the move ✓ Ability to execute offensive cyber and electromagnetic strikes at the tactical level ✓ Robust and self-healing network capable of operating in a denied/degraded environment	**Expeditionary Mission Command / Cyber Electromagnetic**
✓ Robotic and autonomous systems that increase situational understanding, mobility, protection, lethality ✓ Unmanned aerial distribution platforms for responsive sustainment to dispersed units ✓ Capabilities that employ ahead of maneuver, establish networks, provide long-range fire data & enable local security	**Robotics / Autonomous Systems**
✓ Enhanced Soldier lethality through improved fire control, night vision capabilities and countering targets in defilade ✓ Optimized Soldier and Squad performance ✓ Small unit leaders that are connected to the Network	**Plus 1 Soldier & Team Performance & Overmatch**

Big 6+1 Associated Objectives

2018-22 Objectives

Aviation: Set the foundational Aviation force structure by completing Aviation Restructure Initiative (ARI). Continue modernization of the current fleet: AH-64E, UH-60M/V, and CH-47F. Complete Joint Multi-Role Technology Demonstrator to inform Future Vertical Lift.

Combat Vehicles: Address IBCT mobility and lethality shortfalls (Ground Mobility Vehicle and Light Recon Vehicle – Interim JLTV). Improve Stryker Lethality to 2CR ISO ERI. AMPV Prototyping and Low Rate Production to replace obsolete M113. FFV Synthetic and Physical Prototyping and operational Modeling and Simulation. Develop next generation power trains delivering 50% increase in power density and durable light weight track to extend durability, reduce weight, and reduce cost.

Cross Domain Fires: Restore Volcano Dispensers to FMC status. Support USAREUR JEONS for SAVO (hand emplaced employment of Volcano). Field Spider 1A (improved control station). – (Ottawa-compliant)

Robotics and Autonomous Systems: Protecting the force at increased standoff distances. Improving sustainment through Automated Ground Resupply (Leader-Follower). Lighten the Soldier load. Improve situational awareness. Facilitating movement and maneuver (Route clearance and C-IED).

"I'm telling you right now, 10 years from now, if the first person through the breach isn't a robot, shame on us …we can do this."

Deputy Secretary of Defense, Robert Work, November 7, 2015

Advanced Protection: Accelerate Active Protection NDI Strategy (ISO ERI). Begin S&T effort to develop Advanced Protection (ADPROS) (Air). Field Common Missile Warning System (CMWS) and Radar Warning Receiver (RWR) Upgrades. Begin fielding Advanced Threat Detection System (ATDS) and Common Infrared Countermeasure (CIRCM).

Cyber and Electromagnetic: Execute and effectively integrate space, cyberspace and EW operations in support of Unified Land Operations (ULO). Gain and maintain freedom of action and achieve periods of space, cyberspace, EW, and communications operations superiority.

***Soldier Team Performance & Overmatch*:** Connect Small Unit Leaders to Network. Countering Targets in Defilade. Improve Soldier Lethality through Improved Fire Control and Night Vision Capabilities. Integration of Live and Synthetic Training into Soldier Systems. Manned and Unmanned Teaming. Baseline Soldier's Load through the Load Effects Assessment Program – Army (LEAP-A). Soldier Load Task Force.

Big 6+1 Associated Objectives

2023-27 Objectives

Aviation: Begin CH-47F Block II fielding. Complete AH-64E, UH-60M, and UH-60V fielding. Field disruptive technologies: Improved Turbine Engine Program (ITEP), Aircraft Survivability Equipment (ASE), Degraded Visual Environment (DVE) efforts, Small Guided Munitions (SGM). FVL Capability Sets 2 and 3 development. Field runway-independent Tactical UAS.

Combat Vehicles: Improve limited mobile protected firepower capabilities within the IBCTs and SBCTs (Modify existing platforms or COTS procurement, Engineer Change Proposals). Improve Stryker lethality through weapons and optics upgrades. Development of FFV capability to replace BFV FoV. Semi-autonomous and remote-operated ground recon systems to do dull, dirty, dangerous tasks to provide flexibility and tailorability to the CV fleet. High Capacity Band Track and Predictive / Adaptive Suspensions to reduce vehicle weight, cut fuel usage, and reduce lifecycle costs.

Cross Domain Fires: Terrain Shaping Obstacles. Field Ottawa-compliant Gator Landmine Replacement (DTSO).

Robotics and Autonomous Systems: Improve the autonomy of unmanned ground systems. Unmanned air cargo delivery. Increase payloads for ground and air platforms. Introduce exoskeleton technology.

Advanced Protection: Continue Development of Active Protection System under the Vehicle Protection Suite to reduce likelihood of detection and engagement by the enemy (adaptive armors, hardkill and softkill, active blast techniques). Complete ATDS and CIRCM fielding. Begin CIRCM Increment II. Continued ADPROS development, followed by initial fielding.

Cyber and Electromagnetic: Employ the full range of physical and virtual capabilities spanning operations in land, space, and cyberspace. Effectively combine space, cyberspace, EW, and communications operations to influence populations, deny, degrade, disrupt, and destroy adversary mission command networks and weapons systems; and conduct military deception. Maintain overmatch in the space and cyberspace domains. Counter enemies employing technology to disrupt U.S. advantages in communications, long-range precision fires, and surveillance. A-PNT mounted/dismounted capability with point protection, area protection for Army forces

Soldier Team Performance & Overmatch: Integration between Night Vision, Sensor, and Laser Technologies and Command and Control. Family of Vision and Mobility Capabilities. Next Generation Squad Weapons using Lightweight (i.e. polymer, case telescopic, caseless) Ammunition. Small Arms Fire Control (with wind-sensing), Improved Rapid Target Acquisition and Networked Lethality. Establish a Soldier Performance Center (SPC) and Soldier and Squad Performance Optimization (S2PO)

Big 6+1 Associated Objectives

2028-50 Objectives

Aviation: Field FVL Capability Sets 2 and 3. Field CH-47 Block III.

Combat Vehicles: Enhance ABCT deployability, mobility and lethality. New direct fire systems to include a new main battle tank. Divest BFV with FFV fielding. Assess feasibility and application of autonomous or semi-autonomous systems

Cross Domain Fires: Terrain Shaping Obstacles, emplace Close and Mid-range FASCAM before expiration of shelf life (Volcano, MOPMS, ADAM/RAAM, etc...). – (Ottawa-compliant)

Robotics and Autonomous Systems: Machine intelligence, perception, reasoning. Provide information that facilitates onward movement of early entry forces. Operate in advance of maneuver forces to establish network, provide long-range fire data and local security.

Advanced Protection: ADPROS fielding to legacy fleet. Integrate ADPROS and other advanced Aircraft Survivability Equipment (ASE) into FVL.

Cyber and Electromagnetic: *Employ cyberspace offensive and defensive tools to support tactical, operational, and strategic formations. Use of lethal and nonlethal options at all Army echelons that create effects in support of campaign objectives.*

***Soldier Team Performance & Overmatch*:** Reduce Size, Weight and Power of Soldier capabilities. Expanding the Network with Lightweight Soldier Communication Capabilities. Integrate Live, Virtual, Constructive and Gaming Capabilities. Integrate Army Capability Enabler (ACE) Modern Warrior of 2050 initiatives.

The Warfighters' Science and Technology Needs
Mr. Meneghini (STRACD)

Warfighters' Science and Technology Needs Bulletin

Purpose

This document provides an overview of the Warfighters' Science and Technology (S&T) needs to better inform those who develop materiel for the Army.

Produced by:

This document is based on:

- A letter sent by the CG, TRADOC to the AAE recommending prioritization of the Army S&T investment.
- A memorandum sent by the DD, ARCIC to the members of the 2-Star ASTWG.
- Memorandums from each of the COE CGs to the CG, TRADOC regarding their Warfighting Functional S&T Needs.
- The emerging Multi Domain Battle Concept.

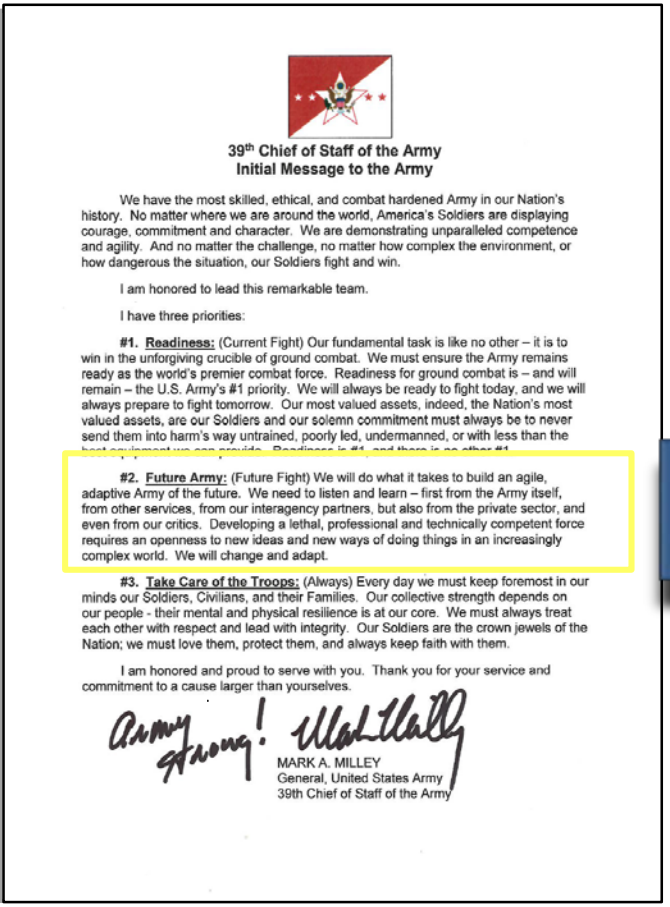
Payoff:

- To assist in assessing how something under development will benefit the Warfighter in the Land Domain since it articulates how TRADOC will assess efforts.
- To assist in making decision on future developmental efforts since it reflect the direction the Army.

http://www.arcic.army.mil/App_Documents/Army-Warfighters-ST-Needs-Bulletin.pdf

Future Force Design Efforts/Campaign of Learning
COL Smith (F2025)

CSA Priorities Linked to Force 2025



39th Chief of Staff of the Army
Initial Message to the Army

We have the most skilled, ethical, and combat hardened Army in our Nation's history. No matter where we are around the world, America's Soldiers are displaying courage, commitment and character. We are demonstrating unparalleled competence and agility. And no matter the challenge, no matter how complex the environment, or how dangerous the situation, our Soldiers fight and win.

I am honored to lead this remarkable team.

I have three priorities:

#1. Readiness: (Current Fight) Our fundamental task is like no other – it is to win in the unforgiving crucible of ground combat. We must ensure the Army remains ready as the world's premier combat force. Readiness for ground combat is – and will remain – the U.S. Army's #1 priority. We will always be ready to fight today, and we will always prepare to fight tomorrow. Our most valued assets, indeed, the Nation's most valued assets, are our Soldiers and our solemn commitment must always be to never send them into harm's way untrained, poorly led, undermanned, or with less than the

#2. Future Army: (Future Fight) We will do what it takes to build an agile, adaptive Army of the future. We need to listen and learn – first from the Army itself, from other services, from our interagency partners, but also from the private sector, and even from our critics. Developing a lethal, professional and technically competent force requires an openness to new ideas and new ways of doing things in an increasingly complex world. We will change and adapt.

#3. Take Care of the Troops: (Always) Every day we must keep foremost in our minds our Soldiers, Civilians, and their Families. Our collective strength depends on our people - their mental and physical resilience is at our core. We must always treat each other with respect and lead with integrity. Our Soldiers are the crown jewels of the Nation; we must love them, protect them, and always keep faith with them.

I am honored and proud to serve with you. Thank you for your service and commitment to a cause larger than yourselves.

Army Strong!

MARK A. MILLEY
General, United States Army
39th Chief of Staff of the Army

Future Army

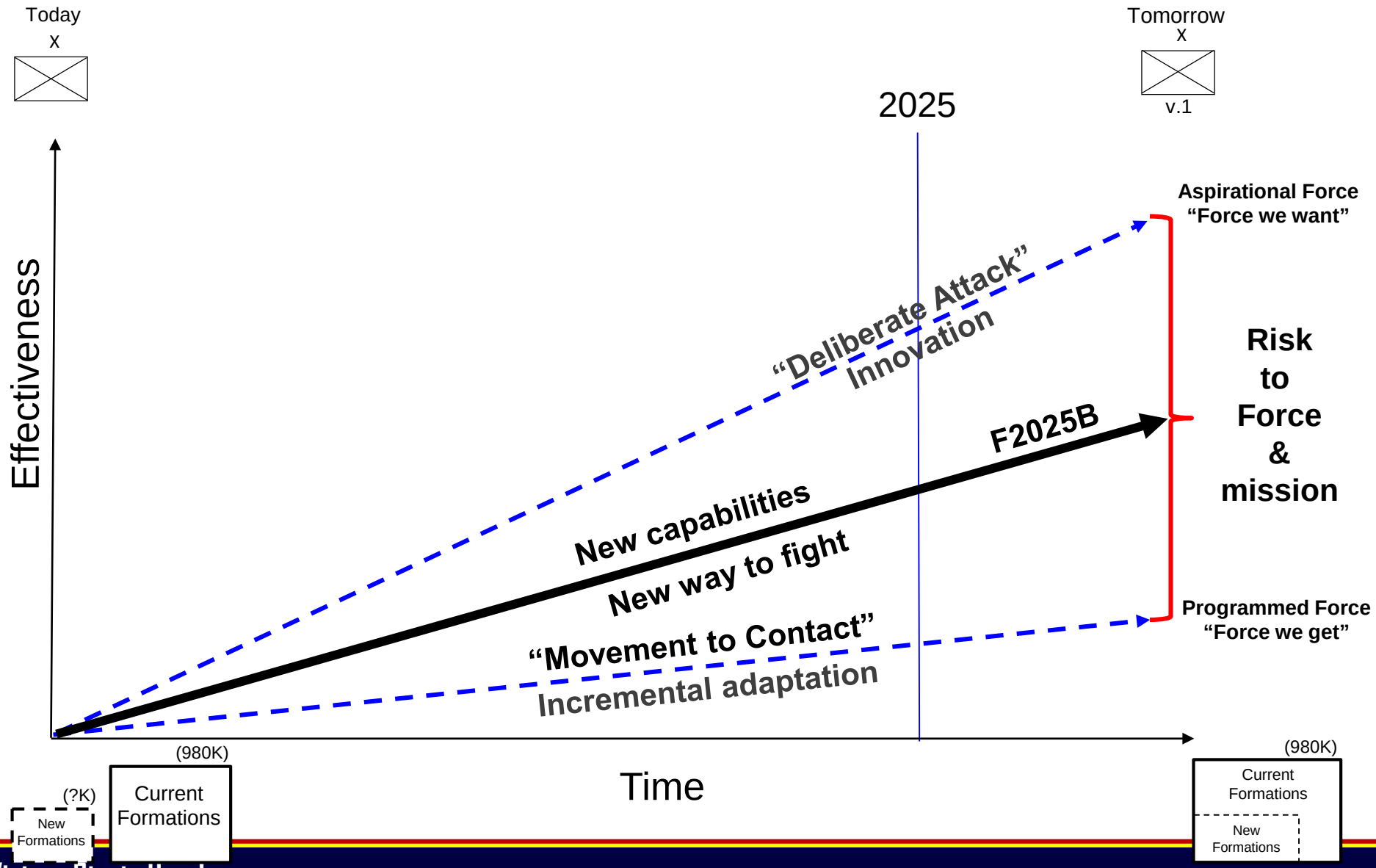
Future Force Development

- Think – establish conceptual foundation for Army Modernization
- Learn – execute Force 2025 Maneuvers; conduct rigorous experiments wargames, and assessments
- Analyze – Examine solutions to Army Warfighting Challenge
- Implement – work as an extension of Army Staff

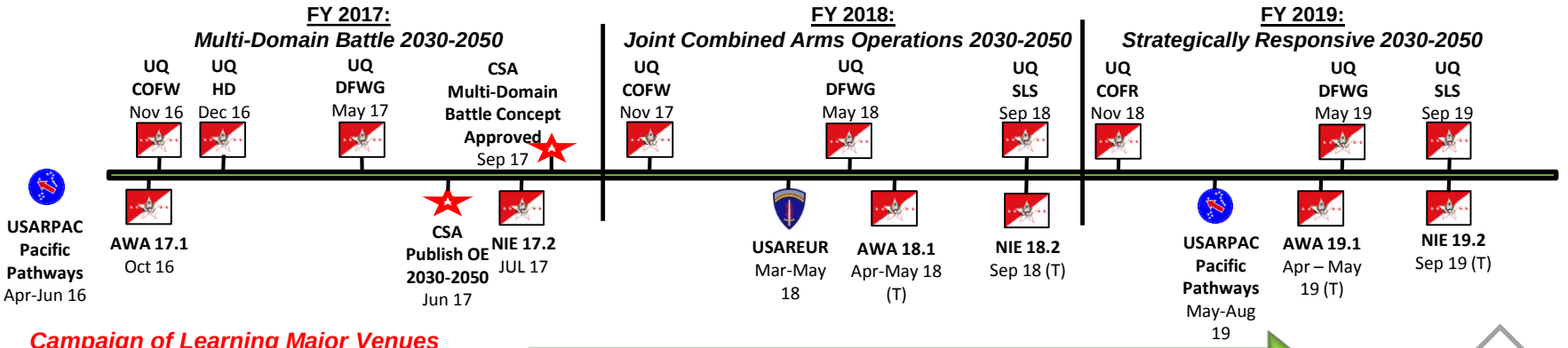
"One of our most important duties as Army professionals is to think clearly about the problem of future armed conflict."

- General David Perkins

Force Design Approach



The Army's Campaign of Learning



Campaign of Learning Major Venues

Network Integration Evaluation

ASCC Exercise (PAC/EUR)

Army Warfighting Assessment

Army Expeditionary Warrior Assessment

Army Warfighting Assessment

Unified Challenge Experimentation

Centers Of Excellence Experimentation

Unified Quest, Deep Futures Studies

Current Force
- Near-term ("current ops") – what's in the POM & budget pipeline
- Army 2020 (current to ~2020)
- Assessment, integration, evaluation & fielding

Next Force
- Mid-Term ("future ops") – what to put in the POM & SPAR
- Force 2025 (~2020-2030)
- Concept Development (Functional Concepts)
- Operational and Organizational Concepts

Future Force
- Far-Term ("future plans") – framing the future
- Force 2025 & Beyond (~2030-2050)
- Revised future operational environment
- Alternative futures & forces

Army Warfighting Challenges

ACRONYMS

AWA = Army Warfighting Assessment
COFW = Character of Future Warfare Dimensions
DFWG = Deep Future Wargame
Integration Evaluation
SLS = Senior Leaders Seminar
UQ = Unified Quest
HD = Human
NIE = Network

Learning Events

- **Unified Quest**. Enables Army leaders to understand, visualize, describe, direct, lead and assess Future Force (2025-2050) development efforts.

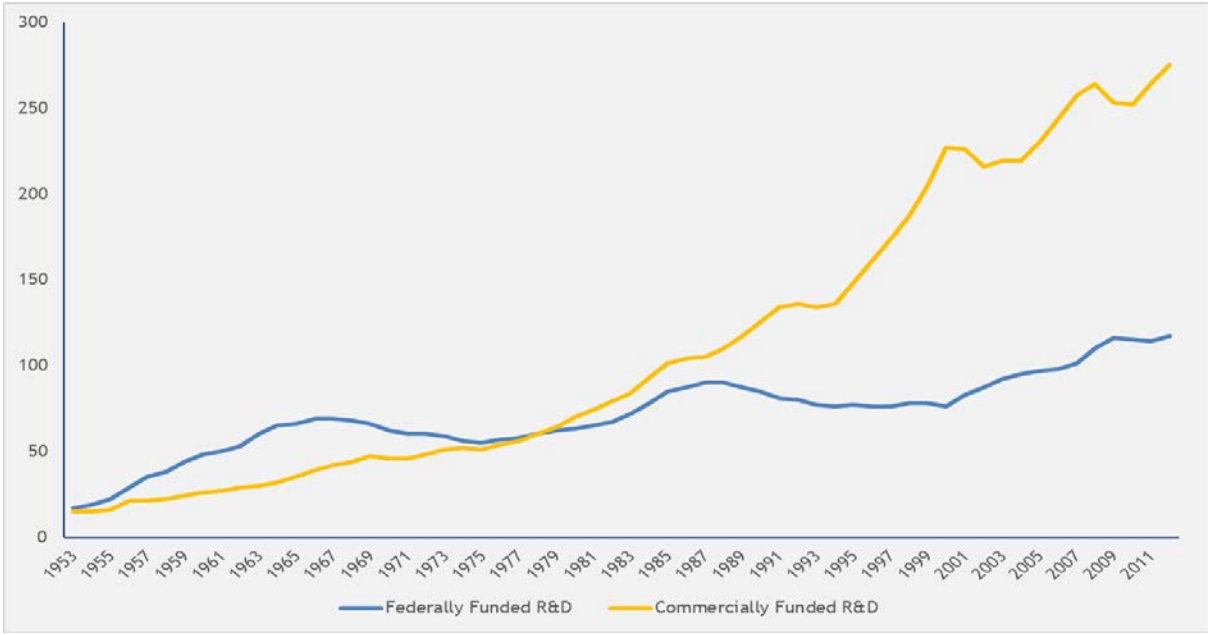
- **Unified Challenge – Army Experimentation**. A series of experiments that will assess the Army's capability to meet projected operational challenges through 2030.

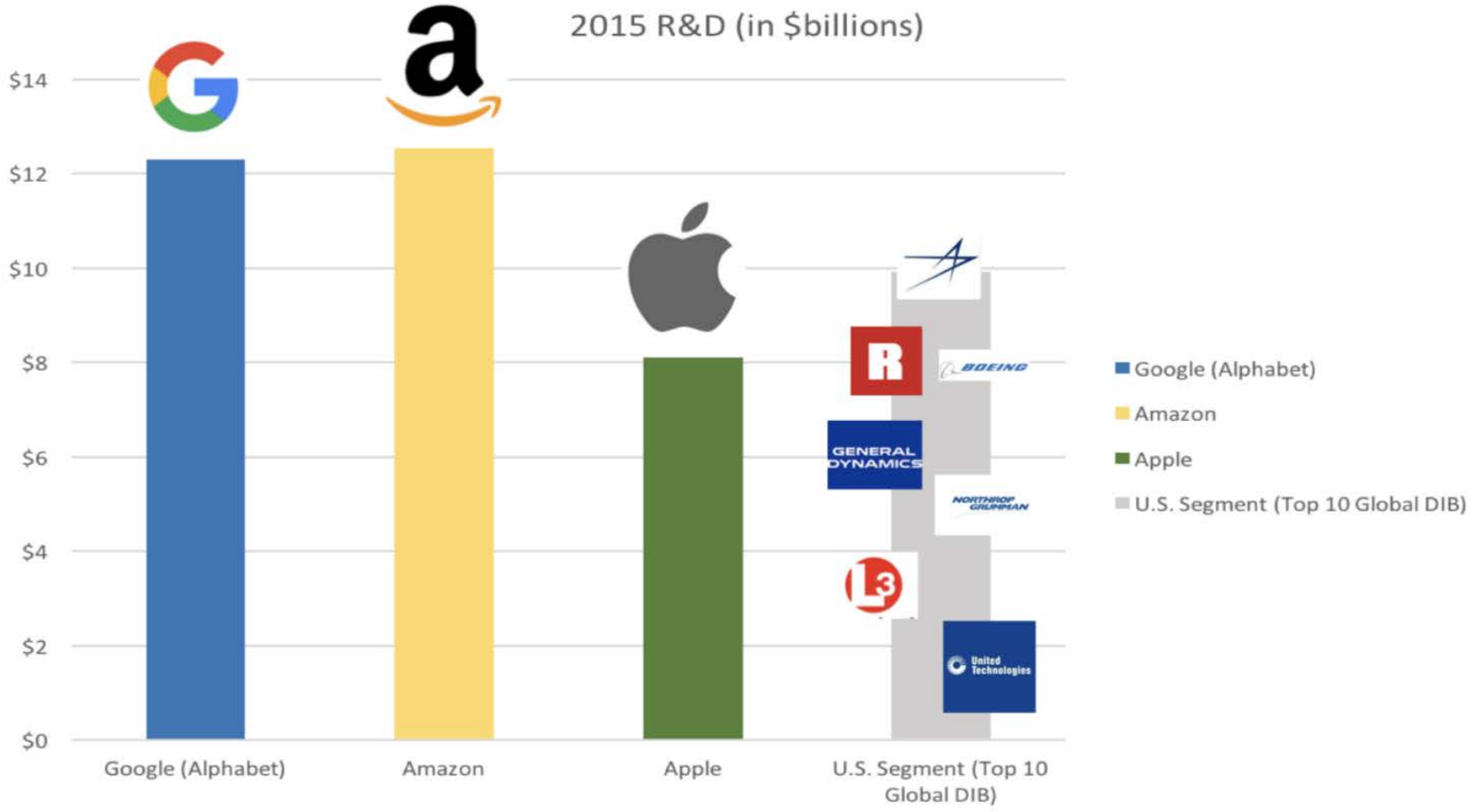
- **Army Warfighting Assessments**. Allows the Army to explore the “art of the possible,” assess concepts, refine requirements, improve systems engineering processes and apply lessons learned to enhance the integration and acquisition of network capabilities.

- **Network Integration Evaluation**. Adaptive and evolutionary approach to designing, integrating, and maturing the Army's tactical network and ensures that the Network satisfies the functional requirements of the force.

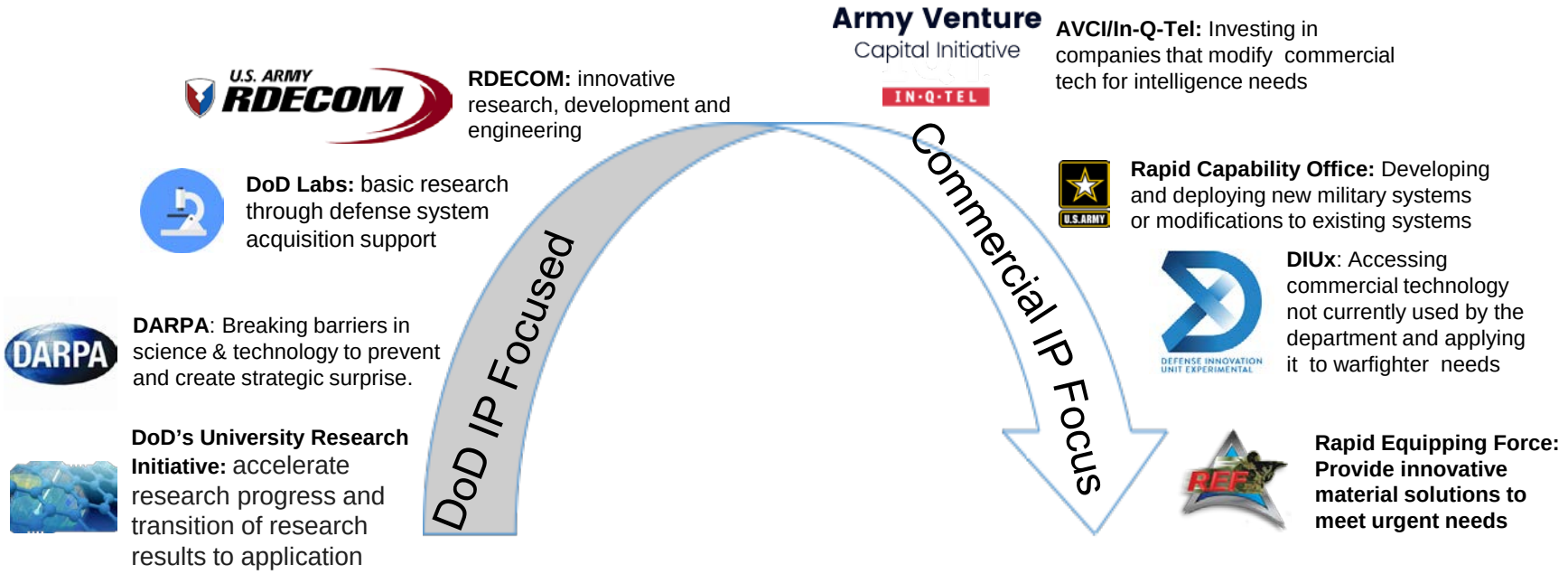
Defense Innovation Unit Experimental (DIUX)
LTC Gossett (DIUX)

U.S. COMMERCIAL R&D IS OUTPACING FEDERAL R&D




2015 R&D (in $billions)
$14
$12
$10
$8
$6
$4
$2
$0
Google (Alphabet)
Amazon
Apple
U.S. Segment (Top 10 Global DIB)
BOEING
GENERAL DYNAMICS
NORTHROP GRUMMAN
United Technologies
Google (Alphabet)
Amazon
Apple
U.S. Segment (Top 10 Global DIB)

Differentiating DoD Tech Activities

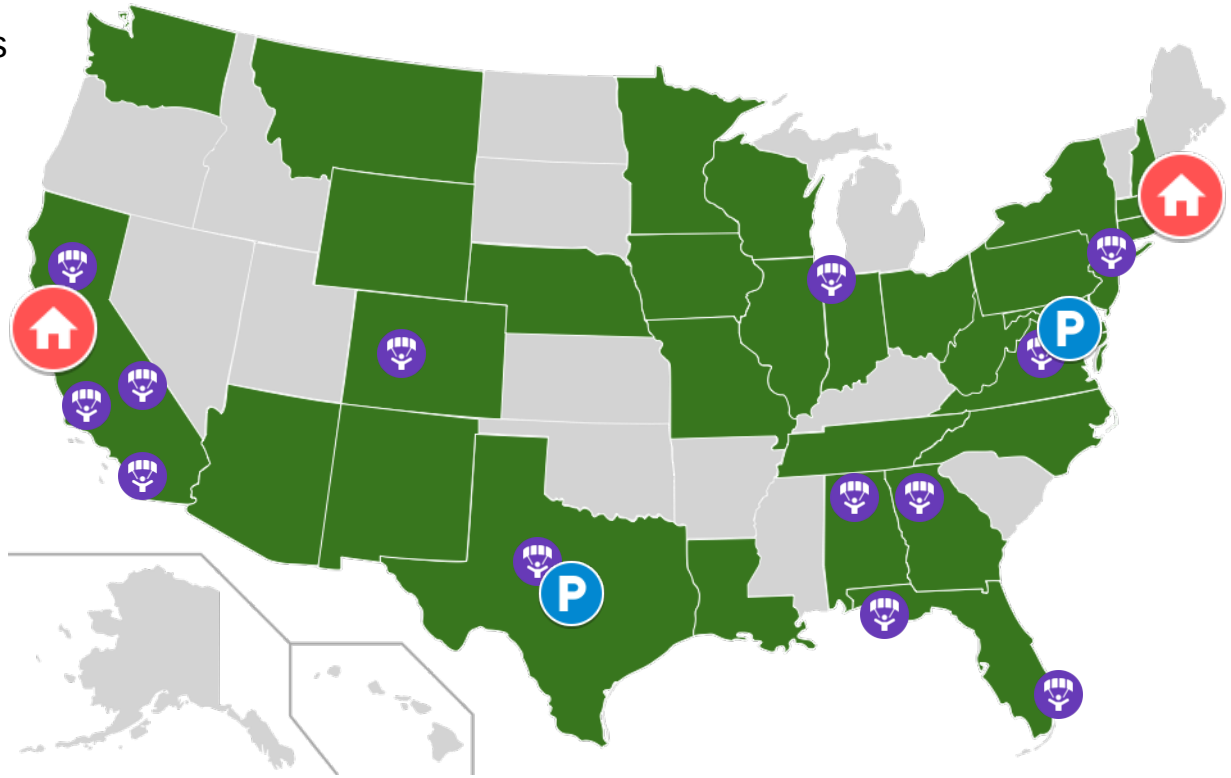


Mandate and National Footprint

Q4 FY16

Engagement events in 9 states

300+ competing co.'s in 31 states



2 Offices (SV and Boston)

2 Presences (Austin and DC)

How to work with us
ideas@diux.mil

1	**DoD Customer Identifies Problem**	Works with DIUx to elaborate “problem to solve” Assigns Product Manager Secures co-funding in year of execution
2	**DIUx Prototypes / Pilots Solutions**	Co-funds preferred solution; leads evaluation efforts Focused on speed (<60 days to contract) and efficiency
3	**DoD Customer Works W/DIUx to Transition**	Able to use CSO for follow-on sole source procurement Tracks value to the warfighter

Commercial Solutions Opening (CSO) vs. FAR

CSO

- Simple diux.mil solicitation
- <60 days to award
- Unprotestable award
- Negotiable payment milestones
- Negotiable terms/conditions
- Negotiable IP/data rights
- Commercial accounting standards
- Sole source justification for follow on procurement

VS

FAR

- Complicated fbo.gov solicitation 18+ months to award
- Protestable award
- Set payment milestones
- Gov’t terms/conditions required
- Stringent IP/data rights
- DCAA accounting standards
- Sole source procurement difficult

Progress to Date

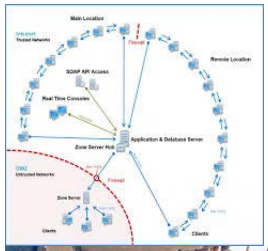
12 CONTRACTS

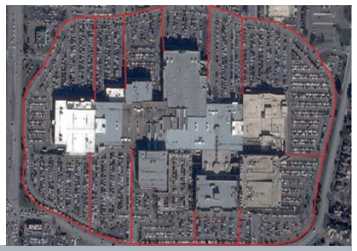
36 MILLION DOLLARS

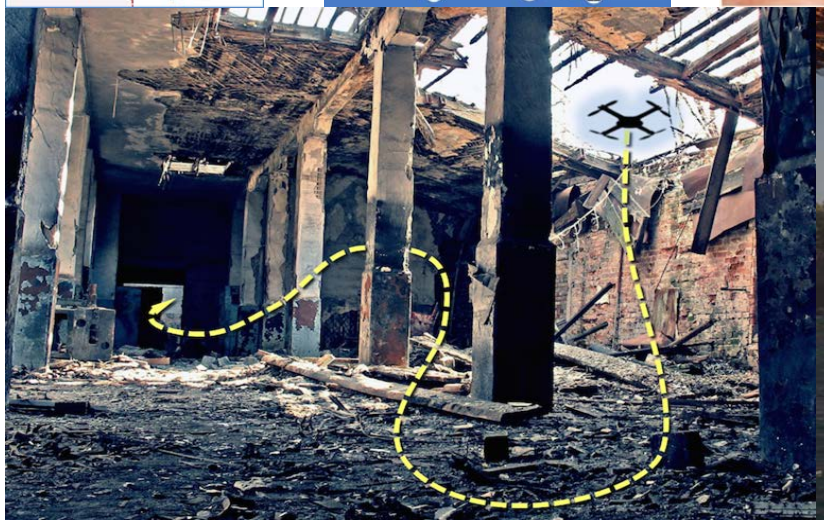
59 DAYS

$1 DIUx : $3 DoD

DIUx PORTFOLIO (Q4 FY16)







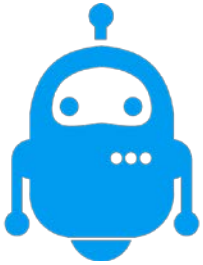
2017 Portfolio Focus

Networking & Security

Systems & Analytics

Life Sciences

Space

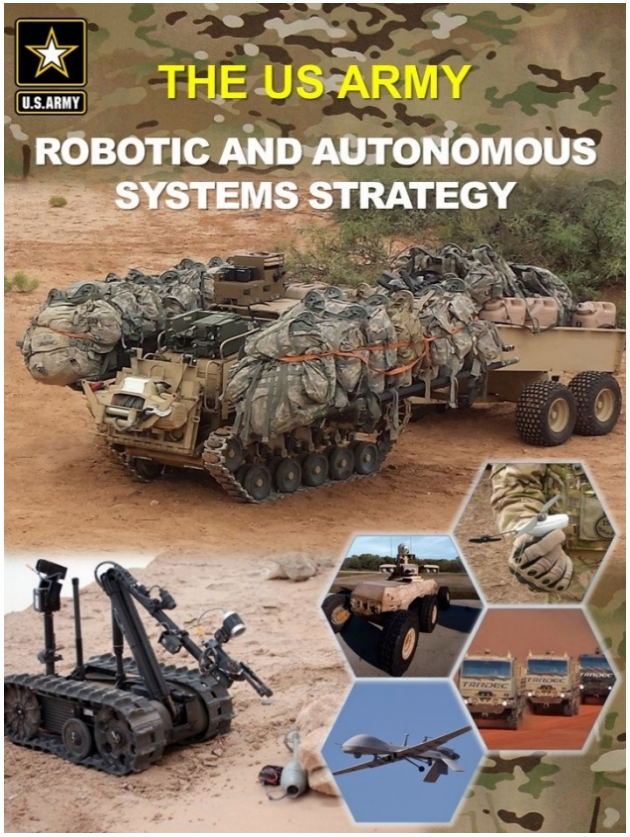


Autonomy

Task Forces: PNT, C-UAS, Computer Vision, Chinese VC

Robotic and Autonomous Systems (RAS)
MAJ Mike Dvorak
ARCIC Robotics Branch

Robotic and Autonomous Systems Strategy



Video Wingman

Objective Capabilities: Over the next 25 years, RAS supports the Army to:

1. Increase situational awareness
2. Lighten the Warfighters' physical and cognitive workloads
3. Sustain the force with improved distribution, throughput, and efficiency
4. Facilitate movement and maneuver
5. Protect the force

Endstate: Increase combat effectiveness of the future force and maintain overmatch against enemies.

RAS Requirements Status

1. Universal Controller – CPD to be separated from CDD
2. Common Robotic System (Individual) – Approved CDD
3. Common Robotic System (Heavy) – Draft CDD
4. Squad Multi-Purpose Equipment Transport – Draft CDD-AROC JAN’17
5. Leader-Follower Automated Resupply – Draft CDD-AROC-FEB’17
6. Robotic Wingman – need CDD for ‘19 (FCS; JCTD)
7. Rucksack Portable UAS– Approved CPD (SRM)
8. Tethered Unmanned Aerial System – No Document
9. Future Family of Tactical UAS (Group 3) – Draft ICD in DA Staffing

Robotic Wingman

Two S&T development phases

Robotic Wingman (2016-2023)
-M113 or HMWWV
-Teleoperation technology+

Program of Record-1

Semi-Autonomous Robotic Wingman (2023-2035)
-Existing combat vehicles used
-Increase in semi-autonomous capability:
Leader-Follower,
Waypoint Navigation,
Obstacle Detection/Avoidance

Program of Record-2

Autonomous Robotic Wingman (2035-2045)
-Purpose built platform
-Fully autonomous navigation capability (teleoperated weapons)

Platform requirements/challenges: Autonomous off-road mobility, obstacle detection and avoidance

Lethal Payload requirements/challenges: external power, self-reload, switch ammo, greater ammo storage

Semi-autonomous weapons station to manage latency and delays

Abrams Lethality Enabler (ALE)

Augment Loader with UGV role

UAVs

Future Demo

UGVs

Demonstration:

What: Abrams Lethality Enabler Experiment

When: Summer 2017

Where: Fort Benning, GA

Why: Assessing augmentation of loader with UGV roles

Robotic Wingman - JCTD

S&T Demonstrator - TARDEC , ARDEC, ONR 30

←-Phase 1: Summer ‘17 – Fort Benning

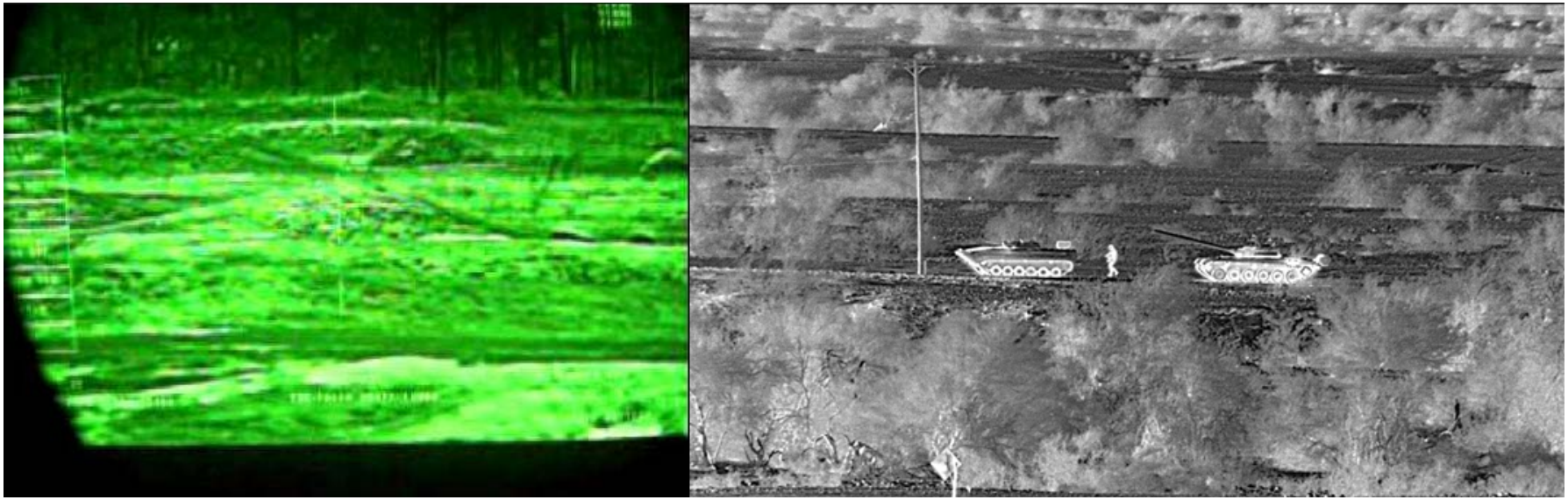
M113 Demonstrator (Phase 2)

Wingman Payload objectives/challenges

- Situational delay vs. latency (need semi-autonomy)
- Field of view (few cameras vs. cameras, Soldiers and buddy-teams)
- Data/target sharing (UxS, sensors, e.g. LRAS3)
- Network connection (local then global)
- ***RWS System Requirements:***
- Purpose Built Externally Powered Weapon
- Not gas fed w/ recoil
- Remotely Reload
- Increased Stowed Ammo Load and remote type change
- Ethernet Based Architecture

Field of View (Soda Straw)

Targeting Steps



Targeting steps:

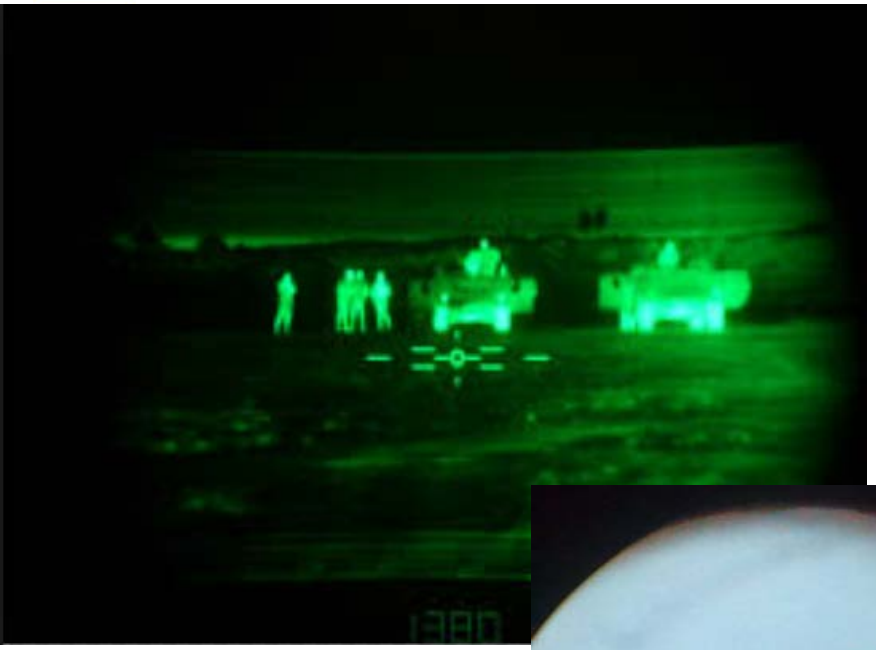
Scan/Acquire

ID

Track

Decide

Targeting 1



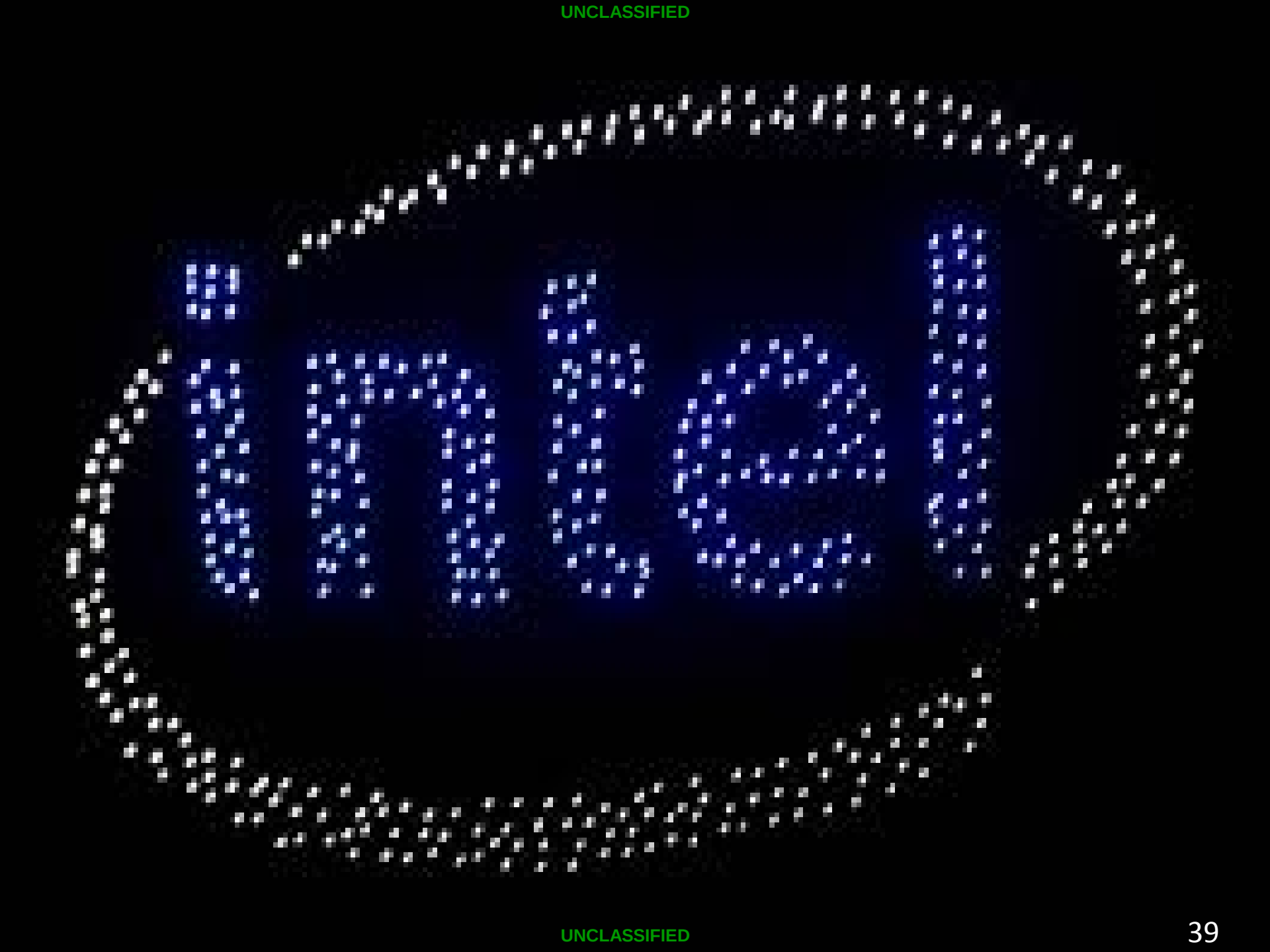
Targeting - 2


HFOV 2
PLGR NOT CONNECTED
POS
NO SELF POSITION
TGT
NO FTL AVAILABLE
1090


MSS OK
AP
1945m
GUN

Wingman Platform Objectives/Challenges

- Platform objectives/challenges:
- Obstacle detection and avoidance; dynamic obstacles; dust, negative obstacles, water and brush/vegetation
- Haptic feedback, driver warnings, reverse-driving
- Dynamic operations; semi-autonomous capabilities
- Speed limited to control & sensors (20-25~ mph); stability control
- Humans in the loop (adds delay; need robots capable of reaction)
- Incorporate operator into systems to mitigate shortfalls with autonomy
- Throughput and bandwidth of comm's
- GPS-denied; C2 vehicle for mapping, dead-reckoning, local comms
- Operation in EW environments (hacking/tamper, spoofing, jamming)
- System of System teaming - mobility and targeting system together
- Separate platform and payload operator
- Canned and automated maneuvers with a push of the button
- 24/7 all-weather sensors - temperature and weather limitations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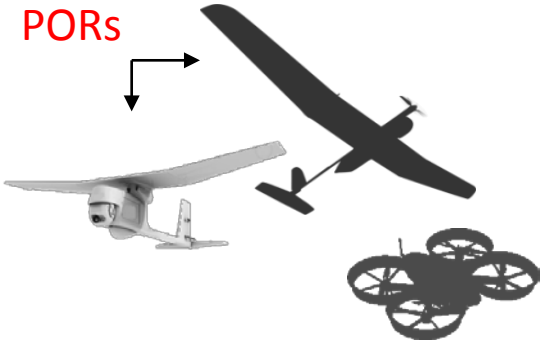
Tactical UAS

PORs



Raven; Puma; Conceptual Short-Range Micro UAS

Conceptual Short-Range Micro UAS

One example of Soldier Borne Sensor (ProxDynamics)

Rooster by Roboteam

Tethered UAS by Sky Sapience

Pegasus by Robotic Research


CHIPOTLE
MEXICAN GRILL


amazon
Prime Air

References

Slide 7:

Left picture:

http://defence.pk/threads/armata-russia%E2%80%99s-top-secret-battle-tank-captured-on-video.366780/page-3

Right Picture: http://www.steelbeasts.com/sbwiki/index.php?title=M60A3_(TTS)

Slide 8:

Right picture: https://www.army.mil/article/133474/Night_turns_into_day__Army_researchers_enable_night_lethality

Left picture: https://www.youtube.com/watch/v%3Dpg7cTXvvIQU&psig=AFQjCNEx17xhx-dww09Fm6Yufvh631X9kQ&ust=1481694228552323

Slide 9:

Top left picture: http://forums.eugensystems.com/viewtopic.php?t=57965&start=70

Top right picture: http://www.military.com/video/operations-and-strategy/air-strikes/apache-fires-rockets-on-insurgents/2160386671001

Bottom picture: https://thesovietarmourblog.blogspot.com/2015/05/t-72-soviet-progeny.html

Slide 10:

Top left picture: www.tank-net.com/forums/index.php/showtopic%3D39887&psig=AFQjCNG1eAyWta_997k-et4MZzP6KByeYA&ust=1481689713643890

Top right picture: www.military.com/video/aircraft/military-aircraft/lockheed-martin-sniper-targeting-pod%2F3778025551001&psig=AFQjCNE89Vfr43taVxdDKNLrTi5jVx5CPQ&ust=1481689878338404

Bottom right picture:

https://www.thesovietarmourblog.blogspot.com/2015/05/t-72-soviet-progeny.html&bvm=bv.141320020,d.cGw&psig=AFQjCNEhliHdQGZg74r_AiBzlcklcC9wWw&ust=1481689682248426\

Slide 12: Disney and Intel Corp.

https://qzprod.files.wordpress.com/2016/11/disney-intel-drone-light-show.jpg?quality=80&strip=all

Slide 13: Intel Corp.

https://newsroom.intel.com/editorials/intel-and-drone-technology-breaking-new-ground/

Slide 14: Roboteam Rooster, Skysapience Tethered UAS, Robotic Research Pegasus

Left bottom picture of Roboteam “Rooster” taken by Michael Dvorak at Roboteam NA HQ.

Middle bottom picture from http://www.skysapience.com/

Right bottom picture of Robotic Research “Pegasus” taken by Michael Dvorak at U.S. Army event

Slide 15: Chipotle: http://www.andnowuknow.com/quick-dish/chipotle-deploys-delivery-drones/melissa-de-leon/50841

Amazon Prime Air: http://www.valuewalk.com/2015/03/amazon-prime-air-faa-approval/

Combat Vehicle Modernization Strategy (CVMS)
LTC Sanchez (MASD)

CVMS Near-/Mid-/Far-Term Focus Areas

***Mid-Term*: Modular Active Protection System (MAPS)**

2035

2030

2025

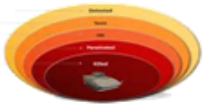
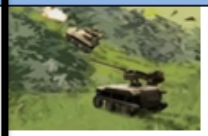
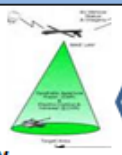
2020

***Far-Term*: Next Generation Combat Vehicle (NGCV) and Robotic Wingman**

***On-going*: ABCT modernization and SBCT lethality**

***Near-Term*: Suite of Complementary Vehicle to support IBCTs**

Means Required for Tomorrow

	Mobility	Protection	Lethality
IBCT	 Need a light solution that moves squad faster than threat	 Need SPS for mission tailorable options, depth and security operations to provide formation protection	 Need mobile, protected, precise firepower
SBCT	 Need upgrade to gain mobility lost to underbelly protection	 Need ability to defeat man-portable rockets and missiles	 Need precise firepower to kill infantry, ATGMs and vehicles at range
ABCT	 Need bridging and recovery assets for complete formation mobility	 Need Sufficient protection against threat spectrum for all vehicles	  Need Autonomy and advanced solutions for overmatch improvement

Priorities

- **Tactical Mobility (near)**
- **Mobile Protected Firepower (near/mid)**
- Light Recon and Security Capability (mid/far)
- Future Requirements for Light Combat Vehicles (Far)

- Protection and Power Upgrades (near)
- **Lethality Upgrades Missile/Cannon (mid)**
- **Future Requirements for Future Medium Combat Vehicle (far)**

- **Replace Obsolete Vehicles (near)**
- **Next Gen Combat Vehicle (mid/far)**
- Autonomous Capabilities (far)

Residual Risk

Formations possess the appropriate combination of mobility, protection and lethality to win and achieve overmatch against likely threat, under anticipated mission variables

Maneuver Portfolio Capability Documents

1. Armored Multi-Purpose Vehicle CDD: AROC Approved
2. **Mobile Protected Fire Power ICD: AROC Approved**
3. **Ground Mobility Vehicle (GMV) Draft CPD: At HQDA G8**
4. **Light Reconnaissance Vehicle (LRV) Draft CDD: At MCoE**
5. **Vehicle Protection Suite (VPS) ICD: At HQDA G8**
6. Next Generation Combat Vehicle (NGCV) ICD: At MCoE

GMV Requirements

***Requirements Update*: AoA complete and results approved by ASARC; CPD revisions complete; AROC (CPD Approval) process initiated 2Q FY17**

(U) Draft GMV CDD Requirements.

- **(U) Lethality** – n/a. GMV is ***not*** intended to be ***a fighting vehicle*** platform. Lethality will be provided by the Squad's organic weapon systems when dismounted.
- **(U) Mobility** – A GMV equipped infantry platoon moving in tactical formation shall ***traverse 62 miles in 8 hours*** over OMS/MP terrain (operate 70% of the time on unimproved surfaces, capable of traversing fine grain soils with a Rating Cone Index of 22). Able to transport a nine Soldier squad ***under rollover protection structure*** with equipment and supplies to sustain ***three days of combat operations***.
- **(U) Protection** – n/a. GMV is not intended to protect the Infantry Squad while mounted. Soldiers operating in GMV have same level of protection as those moving on foot to the objective, but must have a crush resistant frame structure capable of supporting 100 percent of its own Gross Vehicle Weight.
- **(U) Transportability** – GMV at vehicle curb weight (4,500lbs) shall be ***air transportable by UH-60L and CH-47F*** with no vehicle disassembly. Two UH-60L shall be able to transport GMV(s) and a 9-Soldier Squad to a minimum operating radius (OR) of 30 nautical miles (NM) with sufficient fuel to return. CH-47 with a 9-Soldier Squad shall be able to transport a GMV (externally and internally) to a minimum OR of 50 NM with sufficient fuel to return. Transportability ***environmental conditions*** for both aircraft is ***high-hot 4,000 feet*** Pressure Altitude, ***95 degrees*** Fahrenheit ambient temperature. At vehicle curb weight be Low Velocity Airdrop (***LVAD***) capable from ***C-130*** and ***C-17*** aircraft.
- **(U) Sustainability** – n/a. The reliability and maintainability (R&M) characteristics are established and controlled by the commercial marketplace that has achieved a balance between reliability and cost.
- **(U) Energy** – User accepts the energy efficiency of the COTS NDI systems.
- **(U) Size, Weight and Power – Cooling (SWAP-C)**
  - **(U) Net-Ready** – n/a. All Infantry Squad communication will be accomplished with existing dismounted or man-packed radios. GMV shall not connect to the enterprise network.

MPF Requirements

***Requirements Update*: OSD/AAE approved MDD; AoA initiated; Draft CDD informed by CSA guidance (AROCM 16-19/16-20)**

(U) CSA Directed Requirements (AROCM 16-20).

- **(U) Lethality** – MPF must be capable of applying sustained, precise, immediate, lethal, long-range ***fires***, ***on the move***, in day, night and all weather conditions with a main weapon between ***50mm and 120mm cannon***. MPF main gun will be capable of suppressing and destroying 2nd tier main battle tank equivalent armor, destroying and neutralizing a bunker, conducting wall breach, and destroying light armor.
- **(U) Mobility** – MPF will be a ***tracked vehicle*** capable of pivot steer and possess the physical dimension necessary to ***operate*** in complex ***urban and restrictive terrain***. Must be capable of traversing steep hills, narrow trails, and routine natural and man-made obstacles during day or night conditions. Must ***keep pace with other elements*** of the formation.
- **(U) Protection** – MPF will protect the crew from small arms, heavy machine gun, overhead artillery and select CE (chemical energy) and KE (kinetic energy) fires, Improvised Explosive Devices (IEDs), Rocket Propelled Grenades (RPG), and Explosive Formed Penetrators (EFPs). MPF will be capable of increasing protection through the use of add-on armor (e.g., reactive tiles, slat and bar armor, and underbody protection). MPF should be ***capable of hosting*** an existing non-developmental Vehicle Protection Suite (***VPS***)/ Active Protective System (***APS***).
- **(U) Transportability** – Deploy ***two*** combat ready MPF in Essential Combat Configuration (ECC) Level I protection ***by*** a single ***C-17*** aircraft with no change required to the physical configuration. MPF ***air transport*** weight will not exceed ***32 tons*** including all Basic Issue Items (BII), Mission Command equipment, excluding ammunition and Soldier equipment Low Velocity Air Drop (***LVAD***) from C-17 is ***desired but not required***. MPF must be transportable worldwide by all other modes of transportation, including sea, highway, and rail.
- **(U) Sustainability** – In full combat configuration achieve an Operational Availability to complete a ***3 day Seize the Initiative Phase*** based on the MPF Operational Mode Summary and Mission Profile (OMS/MP). Reliability and sustainability must be compatible with infantry units operating in austere environments.
- **(U) Size, Weight and Power – Cooling (SWAP-C)**
  - **(U) Net-Ready** – Provide sufficient space, power, cooling and the interfaces to ***facilitate integration of network technologies*** comparable to those currently found in ABCT combat vehicles as well as those planned for future integration in ABCT combat vehicles. Objective requirement to host or cooperate with future unmanned platforms (air and ground).

LRV Requirements

Requirements Update: JLTV as INTERIM LRV solution; Funding aligned for JLTV/LRV lethality upgrades; JLTV-Reconnaissance Variant (RV) annex in staffing; LRV Draft CDD being generated at MCoE; proposed AROC (CDD approval) 1Q FY18

(U) Draft LRV CDD Requirements.

- **(U) Lethality** – LRV will be capable of ***day/night and adverse weather engagements*** against point moving targets ***to 1000m***. It will incorporate armament (ammunition consistent with current and projected future joint service programs) capable of ***defeating light-medium armored vehicles*** and ground personnel in the open, within urban structures, and earthen bunkers and maintain over-match lethality. LRV will ***mount a modular weapon station*** capable of accepting either RWS-J, LRAS3, or medium caliber lethality. It must have the ability to ***store*** one ***Javelin*** and ***CLU***, and one ***AT4*** internally or externally. LRV will incorporate a ***secondary mounted machine gun*** armament (equal or greater lethality to M240).
- **(U) Mobility** – Possess ***tactical mobility*** (over 300mi) required to ***carry 6 Soldiers*** with equipment for 72 hours ***to support the IBCT*** across worldwide terrain, climatic conditions, and soil types (Rating Cone Index of 22) at speeds consistent with conducting fast-paced military operations (0-60 acceleration in 25 seconds).
- **(U) Protection** – LRV will protect the crew from ***small arms*** to ***NATO*** Standardization Agreement (STAGNAG) 4569 ***Level 1***, and the ability to accept modular upgrades including ***RPG threats*** and ***anti-personnel mines***. LRV will provide scalable, modular armor solutions to protect the crew.
- **(U) Transportability** – Transportable worldwide by air, sea, highway, and rail. LRV at full combat configuration shall be Low Velocity Airdrop (LVAD) capable from a C-130 and C-17 aircraft. At full combat configuration be capable of being externally transportable by CH-47F at High/Hot conditions with a operating radius of 30 NM.
- **(U) Sustainability** – LRV shall have a ***95% probability*** of ***completing its 300mi mission*** at ***92% Operational Availability*** during the 96-hour Major Combat Operation (MCO) as outlined in the OMS/MP.
- **(U) Energy** – LRV, in combat configuration, with Level 1 armor protection, and using standard (JP8) fuel, will have sufficient fuel to operate for a 72 hour mission cycle without refueling while providing ***power at sustained loads*** to support all electrical equipment ***with a 20% margin***.
- **(U) Size, Weight and Power – Cooling (SWAP-C)** LRV will have sufficient SWAP-C to integrate and host network components applicable to its mission role for the formation it supports.
  - **(U) Net-Ready** – Solution architecture products compliant with DOD Enterprise Architecture based on integrated DODAF content; compliant with Net-Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules in the DOD Information Enterprise Architecture; compliant with GIG Technical Guidance; compliant information assurance requirements; and compliant with supportability requirements (SAASM, Spectrum and JTRS requirements).
  - **(U) Cyber** – LRV will be designed to support the Spectrum Supportability requirements of the Joint Battle Command – Platform (JBC-P) CPD.

VPS Requirements

Requirements Update: ICD at DA for staffing; proposed AROC (ICD/MDD Approval) 2Q FY 17; MCoE M & S analysis begun 1Q FY17

(U) Draft VPS ICD Requirements.

- **(U) Lethality** – ***Modular, flexible protection above base vehicle configuration*** against the following threats: incoming direct or indirect fired threat munitions, Rocket Propelled Grenades (RPG), Anti-Tank Guided Missiles (ATGMs), explosively formed projectiles (EFP), Kinetic Energy (KE) munitions, rockets, cannons, lethal unmanned aircraft systems (UAS), air to ground missiles, IEDs and anti-material sniper rifles.
- **(U) Mobility** – VPS should operate in the ***same environmental conditions*** as the ***host vehicle***.
- **(U) Protection** – Prevent kinetic attacks, mitigate lethal effects, and minimize effects from Projectile attacks. Includes ***full frontal, side, top, and rear protection capabilities*** and minimizes hazards to personnel and equipment in close proximity to the vehicle.
- **(U) Transportability** – VPS should operate in the same operational and environmental conditions as the host vehicle and be ***mountable and dismountable by any Soldier*** utilizing BCT organic assets.
- **(U) Sustainability** – Deployment and distribution includes the ability to strategically and operationally move forces and ***sustainment to the point of need*** and operate the Joint Deployment and Distribution Enterprise.
- **(U) Size, Weight and Power – Cooling (SWAP-C) –** Minimal SWAP-C impact on host vehicle.

Major Combat System Service Life Challenge

"The Foundation of our Army is our ability to conduct ***Joint Combined Arms Maneuver***."

GEN Mark Milley
Chief of Staff of the Army

"The other domains are focused on buying *things* to fight other *things*. In the Land Domain we are focused on ***building capability to win***."

GEN David Perkins
Commander, TRADOC

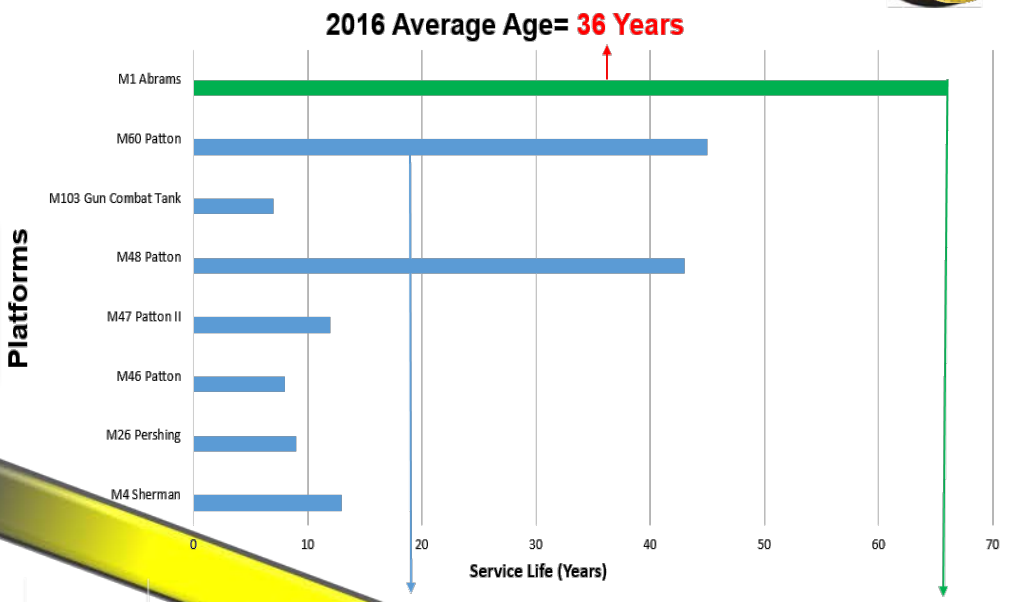
"Hybrid warfare has eclipsed the air-land battle doctrine and force of the 1990s that was built to defeat a monolithic, structured enemy. While the Division centric formation was optimized for training, the modular formation is ***optimized for war-fighting*** and provides Brigade Commanders the ***organic capabilities*** needed to defeat the hybrid threat.

GEN Robert Abrams
Commander, FORSCOM

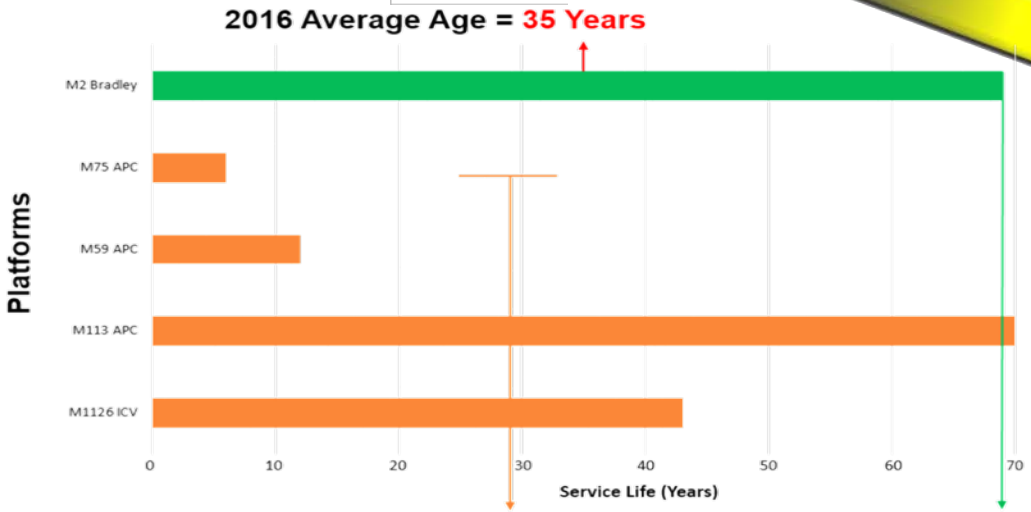
"The current sustained rate of modernization is too infrequent to address platform limitations in all formations."

MG David Bassett
PEO GCS, ASA(ALT)

Abrams



Bradley

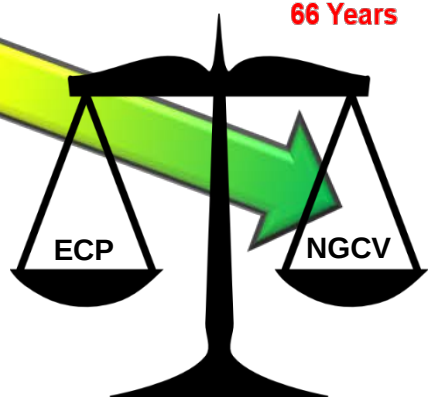


Average before M1
19.5 Years

Projected M1
66 Years

Average before M2
29 Years

Projected M2
69 Years



Balance Budget Constraints Versus Operational Risk

At current funding levels, the Bradley and Abrams will be in the Army inventory for 50-70 years. We need combat vehicles optimized for the 21st Century.

Next Generation Combat Vehicle

Next Gen Powertrain, Energy storage, Track & Suspension, LW Structures

ABCT

SBCT

Mobility

NGCV

Lethality

Protection

Next Gen Weapons And Ammunition, Ammunition Handling and Fire Control, Hostile Fire Detection (sensors)

VPS/MAPS/APS Adaptive Armor Combat Vehicle Adaptive Armor Adaptive, Cooperative Protection

IBCT

NGCV integrates existing technology currently on other platforms while investing in new leap-ahead/disruptive technologies optimized for the 21st Century.

Closing Comments

- **CIE**. The next CIE will be in the July/August 2017 timeframe
- **FIND**. The next FIND will be conducted in conjunction with Winter AUSA, March 2017
- **CIE Feedback.** https://www.surveymonkey.com/r/RVNLV2L
- **Mad Scientist Fictional Writing Contest**. will accept submissions between November 22, 2016 and February 15, 2017. For full details, go to APAN: https://community.apan.org/wg/tradoc-g2/mad-scientist/p/science_fiction_writing_contest/
- **Classified Session**.
  - No phones, recording devices, computers, cameras, smart watches, etc.
  - Will begin at 1330hrs in the Morelli conference room.
  - Park in back of the TRADOC HQ building.
  - Leave time to receive your badge and find a seat.